# Environmental Report 1994

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September 1, 1995

**Lawrence Livermore National Laboratory** 

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This report was created using electronic publishing. The word processing and layout were performed using Microsoft Word on the Macintosh, and the art was created using Adobe Illustrator.

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Work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under contract W-7405-Eng-48.

This report is prepared for the U.S. Department of Energy (DOE) by the Environmental Protection Department (EPD) at the Lawrence Livermore National Laboratory (LLNL). The results of LLNL's environmental monitoring and compliance effort and an assessment of the impact of LLNL operations on the environment and the public are presented in this publication.

To produce a more readable and useful document for our diverse readership—including regulators, scientists and engineers, educators, the media, public interest groups and interested citizens—we have departed from the format used in previous years and divided this report into two volumes. The first describes LLNL's environmental impact and compliance activities and features descriptive and explanatory text, summary data tables, and plots showing data trends. The summary data include measures of the center of data, their spread or variability, and their extreme values. The first volume contains the Executive Summary and the Compliance Summary; it features individual chapters on monitoring of air, sewage, surface water, ground water, soil and sediment, vegetation and food-stuff, and environmental radiation; and it contains chapters on site overview, environmental program information, ground water protection, compliance self-monitoring, radiological dose assessment, and quality assurance. Information on both the Livermore site and Site 300 are presented in each chapter.

The second volume, supporting Volume 1 summary data, is essentially a detailed data report that provides the individual data points, where applicable. Some summary data are also included in Volume 2, and more detailed accounts are given of sample collection and analytical methods.

Volume 1, which is self-contained and can be read without access to Volume 2, contains all information of interest to most of our readers. Volume 1 will be distributed as usual, but Volume 2 will only be sent upon request; a card for this purpose is included on the last page of Volume 1.

As in last year's annual report, data are presented in Système International (SI) units. In particular, the primary units we use for radiological results are becquerels and sieverts for activity and dose, respectively, with curies and rem used secondarily (1 Bq =  $2.7 \times 10^{-11}$  Ci; 1 Sv = 100 rem). Units are discussed in the introduction of Chapter 12, Radiological Dose Assessment, in Volume 1.

This document is the responsibility of the Operations and Regulatory Affairs Division of EPD.

Monitoring data were obtained through the combined efforts of the Environmental Monitoring Section, the Nuclear Chemistry Division, the Radiological Analytical Sciences laboratory, and the Hazards Control Department of LLNL. Special recognition is deserved for the dedication and professionalism of the technicians who carried out environmental monitoring—David Ahre, Paris E. Althouse, Gary A. Bear, David L. Graves, Marion Heaton, Renee Needens, Terrance W. Poole, Donald G. Ramsey, Rebecca J. Ward, and Rhonda L. Welsh—and to the data management personnel—Nina Hankla, Jennifer Clark, Karen Schumacher, Kimberly A. Stanford, and Connie Wells. Special thanks also to Judith L. Kelly for initial preparation of Appendix A and collation and distribution of drafts.

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